FBT-6

- **fieldbus powered**
- **device add & drop indication**
- **shield short indication**
- **measures low, fieldbus and high frequency average and peak noise**
- **measures signal level for all segment devices**
- **assesses segment health**
- **upload measurement data to a PC via USB port**

The Fieldbus Diagnostic Monitor, FBT-6, is used to examine the operation of a live FOUNDATION Fieldbus™ H1 segment without interfering with its operation. The Monitor is intended for maintenance personnel to verify segment operation or to troubleshoot an errant segment.

The FBT-6 Diagnostic Monitor checks for retransmissions from each device on the segment, providing a key performance indicator of segment health. The Monitor also provides measurements of bus voltage level, device signal level, and peak and average noise level. It displays the number of devices present on the segment and indicates when devices are added or removed from the segment. It also detects the presence of a short between either of the signal wires and the cable shield.

Modern fieldbus commissioning procedures require various bus parameters to be measured and recorded. Key parameters include bus voltage, signal level for each device and noise level on each segment or at every device on each segment. Recording the results allows a baseline of the fieldbus physical layer to be established. The Monitor collects this data, and saves up to eight segment reports to be saved for transfer to a PC via a USB port. The reports are saved as Microsoft® Excel files as a comprehensive commissioning and operations report. Considerable savings can be achieved by reducing commissioning time and verifying the correct operation of the segment.

Data collected from periodic segment verification testing or during troubleshooting can be simply transferred to a file for easy comparison to the segment baseline/history measurements. Data can be displayed as tables and graphs using Microsoft® Excel.

Hand-held for portability, the Monitor is powered by the fieldbus so that no battery or external power source is required. It includes color- coded test leads and an LCD display.

OPERATION

The FBT-6 is connected to the segment using the clip-on probes at the end of the cable. The red probe is connected to the fieldbus + wire, the black probe to the – wire and the green probe to the shield wire. The + and – test leads are polarity sensitive and the Monitor will not operate if they are reversed.

When first connected to a fieldbus, a version number is displayed for several seconds. The Monitor then performs a Segment Check providing a quick indication of segment health.

The “FUNCTION” and “SELECT” buttons are used to choose from segment parameters that can be examined with the Monitor. When a function is selected, the data portion of the LCD display is blank until the Monitor has collected and processed the data. After that, the measured value is shown. The indication “OK” is shown if the measured value is within the acceptable range. The indication “BAD” is shown if the measured value is outside of the acceptable range.

The rotating symbol in the lower right corner of the display indicates that there is segment activity. A horizontal bar (underscore) under the rotating symbol indicates that a frame was detected, but could not be decoded. This is not a maintained function, so if a single “bad” frame is detected, the underscore will only display for a short time. Periodic “bad” frames will cause the underscore to blink. The following are more detailed explanations of each of the Monitor’s functions.

Segment Check
When first connected, the FBT-6 gathers data for all of its monitoring functions. If all measured data is within acceptable range, the Monitor displays “ALL MEASUREMENTS OK”.

Voltage
The DC voltage on the segment is shown. By default, measurements over 9 volts are OK. The maximum input voltage is 32.0 volts.

Device Count
If there are fieldbus devices active on the segment, the Monitor counts them. If the count has remained the same since the initial segment check was performed, the display shows “OK”. Note, on FOUNDATION fieldbus™ segments, the Link Active Scheduler (LAS) is considered a device and, as such, is included in the count.
The FBT-6 is more sensitive to missed communications than most PC monitoring software. As a result, a device may still show up on PC monitoring software, even though the FBT-6 has removed the device from its internal list of active devices. Devices having communication difficulties may show up on the FBT-6 as repeatedly being added or dropped.
If a device leaves the segment, the display shows “-”; if a new device is added it shows “+”.

Device
The address (in decimal and hexadecimal) and signal level of each device on the segment is displayed in turn by pushing the “SELECT” button. On FOUNDATION fieldbus™ segments, the first device shown will be the LAS. By default, measurements greater than 150mV are OK. If a device leaves the segment, a “-” is displayed; if a device is added it shows “+”.

Average Noise
Displays the average of the most recent 100 noise measurements. Noise levels are measured and displayed in 3 frequency bands: frequencies in the fieldbus signaling band (Fieldbus Frequency, FF), frequencies below the fieldbus signaling band (Low Frequency, LF) and frequencies above the fieldbus signaling band (High Frequency, HF). The particular frequency band displayed is selected by pushing the “SELECT” button.

Peak Noise
Displays the peak noise recorded since the Monitor was connected. The value displayed is the highest noise level measured since the last reset. Peak noise levels are measured and displayed in the same three frequency bands as average noise.

Retransmit
If a device does not respond to an LAS Pass Token frame, the frame is retransmitted. The FBT-6 indicates the address (decimal and hexadecimal) of the last device that failed to respond to an LAS Pass Token, together with the number of missed pass tokens since the function was reset. If more than 250 retransmits are detected, the display will read “250+”. Pressing the “SELECT” button cycles through screens indicating the number of detected retransmits for each device.

Shield Short
If a short circuit between the + fieldbus wire and the cable shield is detected, “(+) TO SHIELD SHORT” is displayed. If the short is between the – wire and the shield, “(–) TO SHIELD SHORT” is displayed. If a detected shield short goes away the Monitor indicates an INTERMITTENT SHIELD SHORT to (+) or (-).

OPERATION (continued)

Add–Drop
If a new device is added to the segment, the Monitor will display its address and signal level. If a device does not respond to a Pass Token frame, the device is considered "dropped" by the FBT-6 and the Monitor will display the address and last known signal level of the dropped device.

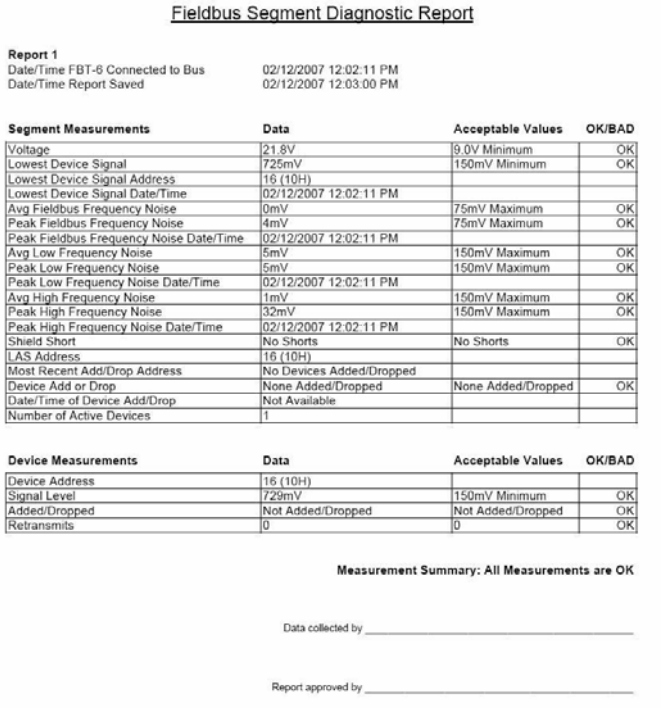
Low
The signal level of the device with the weakest signal is shown. The device's address (in decimal and hexadecimal) is also displayed. This will be the lowest signal level reading from a device since the Monitor was connected to the fieldbus. By default, measurements greater than 150mV are OK.

Save Report
Saves the fieldbus data collected by the Monitor as a report. Up to 8 reports may be saved from multiple network segments and/or multiple locations on one segment.

Transfer Report
Connect the Monitor to a PC USB port and transfer the saved reports to Excel files on the PC.

Set Report Names
Customize the names of the reports saved in the Monitor to easily identify the report source.

Set OK/BAD Limits
Change the limits at which Monitor measurements transition from OK to BAD to establish customized plant standards.



Fieldbus Segment Diagnostic Report

Report 1

Date/Time FBT-6 Connected to Bus	02/12/2007 12:02:11 PM
Date/Time Report Saved	02/12/2007 12:03:00 PM

Segment Measurements	Data	Acceptable Values	OK/BAD
Voltage	21.8V	9.0V Minimum	OK
Lowest Device Signal	725mV	150mV Minimum	OK
Lowest Device Signal Address	16 (10H)		
Lowest Device Signal Date/Time	02/12/2007 12:02:11 PM		
Avg Fieldbus Frequency Noise	0mV	75mV Maximum	OK
Peak Fieldbus Frequency Noise	4mV	75mV Maximum	OK
Peak Fieldbus Frequency Noise Date/Time	02/12/2007 12:02:11 PM		
Avg Low Frequency Noise	5mV	150mV Maximum	OK
Peak Low Frequency Noise	5mV	150mV Maximum	OK
Peak Low Frequency Noise Date/Time	02/12/2007 12:02:11 PM		
Avg High Frequency Noise	1mV	150mV Maximum	OK
Peak High Frequency Noise	32mV	150mV Maximum	OK
Peak High Frequency Noise Date/Time	02/12/2007 12:02:11 PM		
Shield Short	No Shorts	No Shorts	OK
LAS Address	16 (10H)		
Most Recent Add/Drop Address	No Devices Added/Dropped		
Device Add or Drop	None Added/Dropped	None Added/Dropped	OK
Date/Time of Device Add/Drop	Not Available		
Number of Active Devices	1		

Device Measurements	Data	Acceptable Values	OK/BAD
Device Address	16 (10H)		
Signal Level	729mV	150mV Minimum	OK
Added/Dropped	Not Added/Dropped	Not Added/Dropped	OK
Retransmits	0	0	OK

Measurement Summary: All Measurements are OK

Data collected by _____

Report approved by _____

SPECIFICATIONS

Input voltage
Fieldbus Mode: 8 to 32 VDC
USB Mode: 4.1 to 5.5 VDC

Input current
Fieldbus mode: 10mA max.‡
USB mode: 30mA max.

Power dissipation
Fieldbus mode: 320mW max. (@ 32 VDC)
USB mode: 165mW max. (@ 5.5 VDC)

Operating Temperature
–20 to +50°C *

Dimensions
146 x 88 x 28 mm (5.7 x 3.5 x 1.1 inches)

Weight
378g (0.83lb)

Case Material
ABS

DC Voltage measurement range
8 to 32 ± 0.5 VDC

Signal level measurement range
0.12 to 2 Vpp ±10% ± 25mVpp

Noise measurement ranges
LF (50Hz to 4kHz): 0 to 1000 mVpp ±15% ± 25 mVpp
FF (9kHz to 40kHz): 0 to 1000 mVpp ±10% ± 25 mVpp †
HF (90kHz to 350kHz): 0 to 250 mVpp ±20% ± 25mVpp

Software utility and drivers
Operating system: Windows® XP, Windows® 2000
USB version: 1.1, 2.0

(Note: Vpp = Volts peak-to-peak)

* Display update speed is impaired below –10°C

† Excessive noise adjacent to the fieldbus frequency (FF) band will prevent the FBT-6 from reading the fieldbus data and thus reduce functionality.

‡ In fieldbus mode the FBT-6 is powered by the fieldbus and draws approximately 9.4mA of current from the segment (depending on bus voltage and ambient temperature).

FOUNDATION fieldbus™ is a trademark of Fieldbus Foundation™, Austin, Texas

Specifications subject to change without notice.

APPROVALS

Region (Authority)	Standard	Certificate	Approved For	Ratings
EU (Relcom)	EN61326		Class A, Industrial Locations	CE
	EN55022, EN55024		Class B, Information Technology Equipment	
US (Relcom)	EN61326		Class A, Industrial Locations	FCC
	EN55022, EN55024		Class B, Information Technology Equipment	
US (FM)	3600, 3610, 3611, 3810	3023564	Class I, Div 2, ABCD, T4 Class I, Zone 2, IIC T4	NIFW / FNICO Vmax (V): 32 / 17.5 Imax Gps A, B/IIC (mA): 1500 / 274 Imax Gps C, D/IIB, IIA (mA): 1500 / 570
US (FM)	3600, 3610, 3611, 3810	3023564	Class I, Div 1, ABCD, T4 Class I, Zone 0 and 1, AEx/Ex ia IIC T4	Entity IS / FISCO Ui (V): 24 / 17.5 Imax Gps A, B/IIC (mA): 250 / 183 Imax Gps C, D/IIB, IIA (mA): 250 / 380 Pi (W): 1.2 / 5.32
Canada (FM)	C22.2 No. 213, C22.2 No. 157 CAN/CSA-E79-0-95, CAN/CSA-E79-11-95	3028840	Class I, Div 2, ABCD, T4 Class I, Zone 2, IIC T4	NIFW / FNICO Vmax (V): 32 / 17.5 Imax Gps A, B/IIC (mA): 1500 / 274 Imax Gps C, D/IIB, IIA (mA): 1500 / 570
Canada (FM)	C22.2 No. 213, C22.2 No. 157 CAN/CSA-E79-0-95, CAN/CSA-E79-11-95	3028840	Class I, Div 1, ABCD, T4 Class I, Zone 0 and 1, AEx/Ex ia IIC T4	Entity IS / FISCO Ui (V): 24 / 17.5 Imax Gps A, B/IIC (mA): 250 / 183 Imax Gps C, D/IIB, IIA (mA): 250 / 380 Pi (W): 1.2 / 5.32
EU (LCIE)	EN60079-0 (2009), EN60079-11 (2007), EN60079-27 (2008)	LCIE 06 ATEX 6111 X	Ex ia IIC T4	Entity IS / FISCO Ui (V): 24 / 17.5 Ii (mA): 250 / 380 Pi (W): 1.2 / 5.32
EU (Relcom)	EN 60079-0 (2009) EN 60079-11 (2007)	RELC07ATEX 1003X	Ex ic IIC T4 Gc	Vmax=32V, Imax=1.5A
IECEx (FM)	IEC 60079-0 (2004) IEC 60079-11 (2006) IEC 60079-27 (2005)	FME 08.0003X	Ex ia IIC T4 Ex ic IIC T4	Ex ic / Entity IS / FISCO Ui (V): 32 / 24 / 17.5 Ii (mA): 1500 / 250 / 380 Pi (W): NA / 1.2 / 5.32

ORDERING INFORMATION		
Part Number	Description	Picture
FBT-6	Fieldbus Diagnostic Monitor supplied in carrying case with FBT–A61, -A62, and –A63 cables, software and instruction manual.	
FBT-A61	FBT-6 Fieldbus Cable with Mini-Hook Probes	
FBT-A62	FBT-6 USB Cable	
FBT-A63	FBT-6 Fieldbus Cable with Clip-on Probe	
FBT-A64	Clip-on Probe	
501-338	FBT-6 User Manual	